Request for Economic Stimulus Funds

Concept Proposal

Submitter: Project Chair – Alice Gabbard, Director of Diagnostic Intervention; Kentucky Center for Mathematics (KCM); gabbardal@nku.edu; 859.572.7691

Project Title: *The ABC's of Numeracy for Intermediate and Middle Grades Students – Attaining Better Computation Strategies*

Anticipated Project Partners: Northern Kentucky University, Western Kentucky University, the Kentucky Valley Educational Cooperative, Eastern Kentucky University, Kentucky State University, Morehead State University, Murray State University, The Kentucky Department of Education, and Mountain States Mathematics have all worked with the KCM to support primary grades intervention teachers and are anticipated to do the same for this project.

Project Background & Purpose: The purpose of this project is to build foundational numeracy skills in K-8 students by facilitating ongoing teacher growth at the intermediate and middle grades and to further develop a K – 8 Progress Points document that can be used by mathematics intervention teachers as they become teacher leaders. In accomplishing this the intermediate and middle grades teachers will collaborate with the existing experienced, and successful, primary grades mathematics intervention teachers.

One of Kentucky's top goals, as evidenced by recent legislation, is to improve student achievement in mathematics. A common complaint of teachers at all grade levels is that students don't know their basic facts, which is an indication that widening learning gaps can be traced to insufficient development of numeracy in the early grades. Research shows that students' success in early mathematics is predictive of later achievement, not only in mathematics, but in reading as well (Duncan, et. al. 2007). Research also shows that teacher growth is an important factor in improving student achievement (Hill, et. al. 2005) and that sustained, job-embedded professional development is the most effective model leading to changed practice (Darling-Hammond, et. al. 2009). The KCM works to strengthen early numeracy through sustained teacher growth.

Since June 2006 the KCM has trained and supported primary grades mathematics intervention teachers (MITs) whose schools were awarded competitive Mathematics Achievement Fund grants by the Kentucky Department of Education. Throughout these three years MITs have learned many important lessons about understanding and supporting student thinking to engender fluency and flexibility for advanced mental computation and we have seen the value of empowering teachers to drive systemic change. KCM Program Evaluations from the first two years (See http://kymath.org/research.asp) provide evidence of teacher growth and primary grades student success. What began as an effort

dedicated to helping teachers help struggling students has evolved into a grass-roots movement for changing the culture of comprehensive school mathematics programs.

Project Description: Informed by, and building upon, the success of the Kentucky primary grades intervention initiative, the KCM and partners will facilitate the training and ongoing support of vertical teams focused on numeracy development, from kindergarten to eighth grade. These teams will consist of a primary grades intervention specialist who is already in place through the Mathematics Achievement Fund, an intermediate grades mathematics teacher, and/or a middle grades mathematics teacher who will work together within their school district to help struggling students while contributing to the improvement of school-wide numeracy development. In the first year of this program, the focus will be on designing data-driven instruction for operations of addition, subtraction, and place value and the focus will extend to diagnosis and intervention with multiplication and division strategies in the second year.

Forty intermediate grades teachers and forty middle grades teachers from schools in districts that will, in fall 2009, have a *continuing* primary grades mathematics intervention teacher implementing Math Recovery or Add+Vantage MR (in at least one of their elementary schools), will attend 5 days of training in summer 2009 and 5 days of training in summer 2010. Intermediate grades teachers will participate in Add+Vantage MR Course 1 and Course 2 and middle grades teachers will participate in Counting On and Advanced Counting On, a version of Math Recovery targeted for the middle grades classroom. All training experiences will involve live student interviews and will deepen teachers' knowledge of the complexity and development of early arithmetic learning. The proposed budget includes an allowance for additional numeracy development games and activities, resources, and video recording equipment for use during diagnostic interviews and during instruction.

All participants will receive ongoing support through weekly online meetings and quarterly regional vertical team meetings, the purpose being to engage teachers in student-centered problem solving. Further, participants will attend the fall Kentucky Council of Teachers of Mathematics Annual Conference and the spring Kentucky Teaching and Learning Conference or the spring KCM Numeracy Conference. In their second year, participants will share their knowledge with peers during a presentation at one of the state conferences.

If this project is approved, funding will also be available for participants to spend 1 day each year conducting formal professional development for up to six other teachers in their schools, possibly in collaboration with their vertical numeracy development teams.

During this "ABCs of Numeracy" project, the KCM will further extend and refine the Progress Points document (see Appendix A), aligned to the National Council of Teachers of Mathematics (NCTM) Curriculum Focal Points (NCTM 2006), the Kentucky Program of Studies and ACHIEVE Benchmarks, with "I can" statements for 3 progressive descriptors on each item that will clearly show the progression of knowledge and skills necessary for developing a strong numeracy foundation in preschool through eighth grade mathematics. This document will become a useful, standards-based and student-centered

curriculum document for participating teachers to use when leading ongoing professional development within their schools so that all teachers will learn to teach with the depth necessary for all students to attain better computation strategies, thereby providing optimum preparation for proportional reasoning and algebraic thinking required in higher mathematics. The KCM Progress Points will also allow for future strategic statewide professional development and ongoing support in accordance with the NCTM Focal Points, helping teachers to cover less breadth and teach in a way that students gain more depth of understanding and skill.

Project Team: Management will be provided by: Alice Gabbard, KCM Director of Diagnostic Intervention; Jonathan Thomas, KCM Assistant Director of Diagnostic Intervention; Laura Bristol, KCM Assistant Director of Coaching

The content experts who will be recruited to lead the trainings are Petey MacCarty and Kurt Kinsey, Mountain States Mathematics, Sheridan, Wyoming.

Ongoing participating teacher support will be provided by regional coordinators from Kentucky Valley Educational Cooperative, Murray State University, Morehead State University, University of Kentucky, Eastern Kentucky University, Kentucky State University, and Western Kentucky University, who will facilitate online meetings and quarterly in-person regional vertical team meetings for all participants.

The budget includes funds for determining Progress Points validity, teacher numeracy knowledge test development, fidelity observations, and overall program evaluation – components that will be conducted by a variety of qualified researchers to answer the following questions:

- How effective is this project, as implemented, in improving the mathematics achievement of students who are taught by participating teachers? How effective is this project for improving students' beliefs and attitudes about the learning of mathematics?
- What is the impact of this project on participating teachers' knowledge for developing numeracy and what is the impact on their beliefs and attitudes about teaching and learning mathematics?
- How valid and reliable is the KCM Progress Points document for predicting eventual referrals of at-risk students for special education services?

The evaluation team is likely to include: Dr. Michael Mueller, Toronto Hospital for Sick Children; Patricia Sisson, Northern Kentucky University Burkardt Consulting Center; Dr. Pamela Tabor, Havre de Grace, Maryland; Dr. Sarah Eisenhardt, Northern Kentucky University Assistant Professor

Project Budget & Amount of Economic Stimulus Funds Requested: $ 1,616,050 (see Appendix B for budget detail) expended over 2 years will provide for training and ongoing support of 80 teachers who will directly help 5000 students and they will work with 480 other teachers who will indirectly help approximately 30,000 students. The Progress Points portion of this project may ultimately help all Kentucky teachers to track and support student numeracy development.

Appendix A: KCM Progress Points Draft Sample

NCTM FOCAL POINTS *Number and Operations (second grade)*	**KY PROGRAM OF STUDIES** *Primary: Number and Operations*	**PROGRESS POINTS** **Emerging**	**PROGRESS POINTS** **Developing**	**PROGRESS POINTS** **Robust**
-Developing an understanding of the base-ten numeration system and place-value concepts -Developing quick recall of addition facts and related subtraction facts and fluency with multi-digit addition and subtraction.	**ADP ACHIEVE BENCHMARKS** ***Number: Grade 2*** ***(www.achieve.org)***			
Children use their understanding of addition to develop quick recall of basic addition facts and related subtraction facts.	**MA-P-NPO-S-NO11** Students will use mental math, pencil-and-paper methods, calculators and/or computers to explore mathematical concepts	**P2E -3:** I can use at least one advanced mental addition and subtraction **strategy that does not involve counting by ones to** produce the answers to addition and subtraction problems (e.g. 8+7: borrow from the 7 to make 10 and add 10+5)	P2R -3: I can use at least one advanced mental addition and subtraction strategies that do not involve counting by ones **to quickly produce the answers to addition and subtraction problems**	**P2R -3:** I can use **more than one** advanced mental addition and subtraction **strategies that do not involve counting by ones** to quickly produce the answers to addition and subtraction problems
	N.2.3 Add, subtract, and use numbers up to 1,000. a. Add and subtract two- and three-digit numbers with efficiency and understanding. b. Understand "related facts" associated with adding and subtracting.			

Appendix B: Budget Detail

2009/2010 School Year	Training & materials for 40 intermediate teachers to attend AVMR1	$44,000
	Training & materials for 40 middle grades teachers to attend Counting On	$68,000
	Ongoing Participation in the MIT Community for 80 teachers	$29,500
	Travel, housing, meals and stipend for 80 teachers (5 days of training)	$132,000
	Substitute Teachers for 4 Collegial Team Meetings release days for 80	$48,000
	Travel and registration for KCTM Conference, 1 day	$30,400
	Travel, substitute, and registration for KTLC or KCM Conference, 3 days	$108,000
	Materials allowance, including video camera and tripod	$96,000
	PD with materials for 1 day with 6 colleagues each	$120,000
	Fidelity Observations & Coordination	$38,250
	KCM Progress Points development and validity measurement	$95,000
	Teacher Numeracy Test Development & Analysis of Teacher Knowledge	$12,000
	Administration: half time coordinator and support staff	$35,000
	Data Analysis & Program Evaluation Preparation	$12,000
2010/2011 School Year	Training & materials for 40 intermediate teachers to attend AVMR2 and	$44,000
	Training & materials for 40 middle grades teachers to attend Counting On	$68,000
	Ongoing Participation in the MIT Community for 80 teachers	$29,500
	Travel, housing, meals and stipend for 80 teachers (5 days of training)	$132,000
	Substitute Teachers for 4 Collegial Team Meetings release days for 80	$48,000
	Travel and registration for KCTM Conference, 1 day	$30,400
	Travel, substitute, and registration for KTLC or KCM Conference, 3 days	$108,000
	Materials allowance	$64,000
	PD with materials for 1 day with 6 colleagues each	$120,000
	Fidelity Observations	$45,000
	Administration: half time coordinator and support staff	$35,000
	Data Analysis & Program Evaluation Preparation	$12,000
	Teacher Numeracy Test Development & Analysis of Teacher Knowledge	$12,000
	Requested Stimulus Funds	$1,616,050

Appendix C: References

Darling-Hammond, Linda, et. al. (February 2009) *Professional Learning in a Learning Profession; A Status Report on Teacher Development in the US and Abroad*, National Staff Development Council.

Duncan, Greg, et. al. (2007) School Readiness and Later Achievement. Developmental Psychology, The American Psychological Association. Vol. 43, No. 6, 1428 – 1446.

National Council of Teachers of Mathematics. (2006) *Curriculum Focal Points for Prekindergarten through Grade 8: A Quest for Coherence* http://www.nctm.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=282

Hill, Heather C., Rowan, Brian, and Ball, Deborah Loewenberg. (Summer 2005) *Effects of Teachers' Mathematical Knowledge for Teaching on Student Achievement.* American Educational Research Journal, Vol. 42, No. 2, pp. 371 – 406.